

ECONOMICS OF RICE PRODUCTION: A Case Study of Bauchi Local Government Area, Bauchi State, Nigeria

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ABSTRACT

The study determined the costs and returns of rice production among farmers in Bauchi Local Government Area. Primary data were collected with the aid of structured questionnaires which were administered to fifty (50) purposively selected rice farmers. Data collected were analyzed using descriptive statistics, farm budgeting and regression analysis. The study revealed that majority (40%) of the farmers were within the age of 41-50 years with a mean age of 40.5 years. Also, majority of them (72%) were males and 80% had formal education. Furthermore, the result revealed that majority of the farmers (42%) had 1-10 years of farming experience and a mean age of 14.1 years, also 42% had farm size of 1.5-2.4 hectare per farmer with a mean of 2.25 ha. The study revealed that the farmers realized a net farm income of N33, 822.29 per ha. Also the returns on every naira invested as well as operating ratio and fixed ratio were 0.77, 0.45 and 0.14 respectively. The R-square value was 93.1%, Furthermore, seeds, herbicides and farm-size had significant effect on the output of rice ($p \leq 0.01$) and ($p \leq 0.05$) respectively. The marginal value product to marginal factor cost ratio revealed that fertilizer, herbicides, labour and farm-size were under-utilized. The identified problems facing rice farmers among others include: high cost of fertilizer and other chemicals, high cost of labour, low and unstable produce price. The study recommended that government and stakeholders should ensure adequate provision of inputs and provision of infrastructures to increase rice production.

KEY WORDS : Rice , Production , Cost , Bauchi , Returns

BACKGROUND INFORMATION

Rice is a very important food crop in Nigeria which is cultivated in most part of the country in both rainy and dry season., though its production is massive, it is not enough to fight the increasing food crisis in the country. As a result of this, there has been the resurgence of the government on the increase in the level and quality of production by enhancing the competitiveness thereby converting rice production into an efficient generator of national income (WARDA, 2003).

Rice production in Nigeria has boomed during the last decades, particularly as a result of vast increase in rice area under cultivation and to a lesser extent through increases in rice yield (Olaf and Lancon, 2003). Notwithstanding, the production increases was insufficient to match the consumption increase, thus rice imports making up for the short fall. The importation trends have indeed oscillated over the last decades and have surged lately from 3000,000 metric tones in 1995 to 687, 925,000 metric tones in 1998, amounting to US \$259 millions (USDA FAS, 2003 ; WARDA, 2003). In the year 2002, 1.9 million metric tones of rice valued at approximately US \$500 million were imported (USDA FAS, 2003) while post-forecast Nigeria's rice import in market year 2005 was 1.5 million metric tones.

In order to arrest food crisis, there has been effort by the government to increase the productivity in rice production because of it's importance. Generally there has been a considerable increase in world grain production which amounts to 100% for rice (FAO, 1995). As at 1991, over 90% of the world production (483 million tones) was from in Asia, but the biggest rice producers are China (172 million tones), India (102 million tones), Indonesia (42 million tones), Bangladesh (22 millions tones), Thailand (21 million tones), and Japan (12 million tones). Outside Asia, the largest producers are Brazil and United States of America (USA) with 118 and 7.2million tones respectively (Rehm and Gustav, 1991).

In Nigeria, rice is cultivated in virtually all the agro ecological zones. Despite this, the area cultivated still appears small, as in 2000 out of about 25 million hectares of land cultivated to various food crops only about 6.39% was cultivated to rice (Akpokodje, *et al* 2001). The major producing states are from the northern part and Bauchi State is among the first ten producing states in Nigeria. The major challenge in rice sector is to bring the best of domestic rice domino to internationally competitive levels and at the same time to increase or raise the quality up to the international standards. This will substitute domestic rice for improve rice without having to impose significant loses to the Nigerian economy. Boosting the performance of our local rice has a significant multiplier effect for both rural and urban economy. This will ensure significant cash injection into the rural economy including significant cash income for the farm household and others.

There is need to carry out a study on the production aspect of the major staple food in the country particularly rice as a result of persistent food crisis (high cost and low production) in the country. Costs and returns are invaluable consideration in the production of any enterprise as they are used to determine the profitability of the enterprise (Ladan, 1995). Thus, it is important in decision making of intending investors in rice farming in particular. To increase output in rice production, farmers need to realize profit from the enterprise.

This study was designed to provide answers to the following questions regarding rice production in the study area:

1. Do rice farmers realize profit from the enterprise?
2. What are the constraints towards increasing production of rice in the study Area ?
3. What are the socio-economic characteristics of rice farmers?
4. Are resources being efficiently used and how can we increase production output, profit level etc ?.

The broad objective was to evaluate the economics of rice production in Bauchi Local Government Area. The specific objectives were to:

1. determine the socio-economic characteristics of the farmers in the study area;
2. determine the costs and returns of rice farming;
3. determine the resource use efficiency of the rice farmers; and
4. identify major constraints in rice production.

METHODOLOGY

Study Area

The study area is Bauchi Local Government Area of Bauchi State. The area is classified under the western zone by Bauchi State Agricultural Development Programme (BSADP). Being the state capital, it is one of the 20 L.G.A's of the state. It is bounded by Alkaleri, Toro, Dass and Ganjuwa L.G.A's to the south, west and north respectively. It is located in the Northern Guinea Savannah Zone of Nigeria and lies within the Longitude and Latitude of 10°N and 9°E respectively with an altitude of 690.2m above the sea level. The population of the study area was 462,077 with land area span of 32,400sq.km (BSADP, 1995). The economic activities of the inhabitants is predominantly food crop farming such as grains and legumes, trading and livestock production (BSADP, 1995).

Sampling Techniques

Bauchi Local Government Area was selected for this study because rice is one of the major crops produced in the area. A multi-staged sampling techniques was adopted which involves the selection of the three districts in Bauchi Local Government Area namely; Zungur, Galambi and Bauchi. Therefore ten (10) villages were selected from the districts namely; Miri, Turum, Liman Katagum, Galambi, Dan'iya, Zungur, Kangere, Birshi, Yelwa, Gwallameji and five (5) respondents were chosen from each village purposively making a total of fifty respondents in all.

METHOD OF DATA COLLECTION

Information from the respondents were collected by means of questionnaires.

Analytical Tools

The tools used for the analysis in this study include descriptive statistics, farm budgeting and regression analysis.

Descriptive statistics

Descriptive statistics were used mainly for the analysis of the socio-economic characteristics of the respondents. This involved the use of mean, frequency distribution and percentages.

Farm budgeting analysis

This analytical method was adopted for measuring farm business performance. Farm budgeting analysis enables the estimation of the total expenses (costs) as well as various receipts (revenue or returns) within a production period (Olukosi and Erhabor, 1989). Similarly, measures of farm performance that include; Operating Ratio, Fixed Ratio and so on.

Operating ratio (OR)

This was calculated by dividing the total operating costs by the total revenue.

$$\text{Operating Ratio} = \frac{\text{Total Variable Costs}}{\text{Total Revenue}} = \frac{\text{TVC}}{\text{TR}} \text{ ----- (1)}$$

Fixed ratio (FR)

The fixed ratio was calculated by dividing the Total fixed costs by the Total revenue.

$$\text{Fixed Ratio} = \frac{\text{Total Fixed Costs}}{\text{Total Revenue}} = \frac{\text{TFC}}{\text{TR}} \text{ ----- (2)}$$

Net farm income (NFI)

This is the difference between the gross receipts and the total cost of production. It is defined as the surplus resulting from business operation which could be withdrawn without reducing the future scale of the business.

NFI calculated as follows:

$$\begin{aligned} \text{NFI} &= \text{GR} - (\text{FC} + \text{VC}) \text{ --- (3)} \\ \text{NFI} &= \text{Net Farm Income} \\ \text{GR} &= \text{Gross Receipts} \\ \text{FC} &= \text{Fixed Costs} \\ \text{VC} &= \text{Variable costs} \end{aligned}$$

Regression analysis

To determine the resource-use efficiency and production function, multiple regression was used because there are more than one variable which constitute the costs of production. Olukosi and Ogungbile (1989) stated that numerous algebraic equation forms can be used to derive production functions. For the purpose of this study, Cobb-Douglas function was considered and the explicit functional form adopted in this study is as follows:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \varepsilon \text{ ----- (4)}$$

Where:

X_1 - Seeds
 X_2 - Fertilizer
 X_3 - Herbicides
 X_4 - Labour
 X_5 - Farm size
 β_0 - β_5 - Coefficients
 ε - Random error

RESULTS AND DISCUSSION

Physical costs and returns on various resources used in production Costs of production is the total expenses incurred in the process of production. Cost and returns analysis can equally determine the profitability of the production at the end of the production period. It is important to keep reviewing the costs of resources used in

rice production from time to time because the economic system is dynamic, it changes frequently as a result of inflation and depression.

In this study, labour costs constituted the highest percentage of the total cost of production 40.53% while cost of land and fertilizer costs are 21.98% and 16.28% respectively (Table 1). Majority of the respondents are not spending much on fertilizer basically because of the market price and less availability of the subsidized ones.

Farm revenue is the total returns obtained by all the respondents at the end of the season. The Fixed Ratio and Operating Ratio shows the ratio of the fixed costs and variable costs to the total revenue, the lower the ratio the better and higher the returns per naira invested. The total income realized by the farmer depends basically on demand and supply of the commodity after harvest.

Table 1: Summary of the costs of production

Variable cost	Value (N/ha)	Percentage
Seed	2,312.33	5.25
Fertilizer	7,165.82	16.28
Herbicides	1,368.91	3.11
Insecticides	476.67	1.08
Labour	17,839.23	40.53
Transportation	4,157.23	9.45
Fixed costs		
Depreciation of farm		
Implements	1,106.37	2.31
Land (Purchased)	9,674.64	21.98
Total costs (TC)	44,011.42	100.00
Financial returns (N/ha)		
Net Farm Income (NFI)	N33, 822.29/ha	
Measures of financial success		
Fixed Ratio (FR)	0.14	
Operating Ratio (OR)	0.45	
Returns on naira invested (R/N)	0.77	

Source: Field survey, 2006

Production Function Analysis of Rice Production

The Cobb-Douglas function assumes a constant elasticity of production over the entire input-output curve. It normally exhibit a non-linear relationship and does not give a defined maximum response at all input levels, Olukosi and Ogungbile (1989). The relation between the output produced and variables affecting production was estimated using multiple regression analysis and the result is presented in Table 2.

Based on comparison of adjusted coefficient of multiple determination (R^2) and statistical significance of the estimated regression coefficients the cobb-Douglas function indicated that 93.1% of the variation in yield was explained by explained by the factors specified in the model (Table 2). The F-value which measures the joint significant of all the explanatory variables was found to be 111.534 which was highly significant at 0.01%. This shows that taking together, the included explanatory variables significantly explain the variation in total product. The unaccounted variations were attributed to other explanatory factors such as weather conditions, soil condition, date of planting which has not been included in the model.

However, using the T-value of the regression coefficient seeds (X_1), herbicides (X_3) are found to be statistically significant ($p < 0.01$) and ($p < 0.05$) respectively. However farm-size (X_5) was negatively significant ($p \leq 0.05$)

while fertilizer (X_2) and labour (X_4) were not statistically significant. This result implies that a unit increase of seed in rice production accounted for 1.021Kg increase in the output. This means the more the quantity of seeds

Table 2: Regression result for factors affecting rice output

Estimated Index	Variable Names	Regression Coefficient	T-value
	Constant		-3.890***
X_1	Seeds	1.021	11.193***
X_2	Fertilizers	0.014	0.354 ^{NS}
X_3	Herbicides	0.387	3.337**
X_4	Labour	-0.074	-1.066 ^{NS}
X_5	Farm size	-0.433	-3.556**

Source: Field survey, 2006

R-squared = 93.1%, F-value = 111.534***, Note:***= Significant at 0.01 level
 ** = Significant at 0.05 level, NS = Not significant

used the higher the output. But fertilizer and labour which showed no significant relationship should be increased to cause an increment in the output. Also a unit increase in herbicide use in farmers land accounted for 0.387Kg increase in the output, thus it should be encouraged to use more of it. While results on farm-size indicated that a unit increase in farm-size accounted for -0.433Kg decrease in the rice output, this implies that the larger the farm-size the lower the output. Therefore it is not encourage for the farmers to increase their farm size under the current practice.

Resource use efficiency in the study area

Table 3 shows the marginal value productivity as well the marginal factor cost (acquisition cost) per unit of the variable input.

Table 3: Marginal factor costs and marginal value products showing resource use efficiency of the farmers

Variables	MVP	MFC	MVP/MFC
(Seeds) X_1	57.29	34.88	2.30
(Fertilizers) X_2	0.79	31.86	0.02
(Herbicides) X_3	21.71	250.31	0.09
(Labour) X_4	-4.15	2,461.80	-0.002
(Farm size) X_5	-24.30	1,340.60	-0.18

Source: Field survey, 2006

MVP= Value added to the output due to the use of an additional unit of input.

MFC= Cost of one unit of a particular input (e.g seeds ,labour and so on).

MVP/MFC= Ratio that indicates the relative efficiency of inputs used.

Table 3 shows that seeds has Marginal Value Product (MVP) of 57.29 naira which is higher than Marginal Factor Cost (MFC) acquisition cost of 34.88 naira. This implies that increasing seeds by one unit would lead to additional expense of 34.88 naira and revenue of 57.29 naira. So, farmers are thus encouraged to use more of the factors. The Marginal Value Product (MVP) of fertilizers and herbicides were much lower than marginal factor cost and this implies that the expenses incurred as a result of one unit increase in one of these variables is greater than the revenue. There is a need to therefore further subsidies these input resources to increase output and revenue. Similarly, the Marginal Value Product (MVP) of labour and farm-size shows -4.15 naira and –

24.30 naira respectively while the Marginal Factor Cost were 2,461.80 and 1,340.06 naira respectively. This indicates that these resources are used above economic optimum thus the use of labour saving mechanism should be encouraged.

Table 4 illustrates some of the major constraints in rice-production in the study area. It can be observed that high costs of farm inputs such as seeds, fertilizers and other chemicals, high cost of labour, low and unstable produce price are ranked 1st as the major problems (100%). While inadequate extension services constitute the minimum (40%) problem facing the farmers in the study area.

CONCLUSION

This study may conclude that rice is an important cereal in the study area and is use mainly as human food, and the bye-product such as straws, hays, for animal feeds. Farmers in the study area are making profit from rice production. Also, seeds and herbicides were found to be affecting the output of rice significantly. The farmers

Table 4: Distribution of Respondents According to Constraint of Rice Production

Identified problems	Frequency	Percentage	Ranking
Land tenure system	45	90	2
High costs of seeds, fertilizer and other Chemicals	50	100	1
Inadequate credit provision	45	90	2
Inadequate high yielding variety	40	80	3
High costs of labour	50	100	1
Low and unstable produce price	50	100	1
Inadequate storage	40	80	3
Inadequate extension service	20	40	4

Source: Field survey, 2006

should be encouraged to use more fertilizer and labour saving mechanism. According to Chandhary, (1988), given a proper treatment of appropriate technology, management and policy support, Nigeria can attain self-sufficiency in rice in the immediate future.

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